



A Library Linked Data use case: datos.bne.es and



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INRIA
Grenoble, France
9th of May 2012

- **Ontology Engineering Group**
- Library Linked Data and Motivation
- `datos.bne.es` project
- MARiMbA
- Results and comparison

Director: A. Gómez-Pérez

Research Group (30 people)

- 2 Full Professors
- 4 Associate Professors
- 2 Assistant Professor
- 5 Postdocs
- 16 PhD Students
- 1 MSc Students

Technical support (3 people)

- 2 software engineers
- 1 system administrator

Management (3 people)

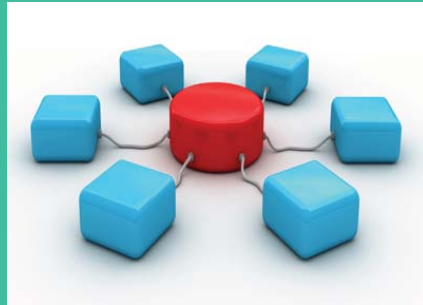
- 1 Project Manager
- 2 administrative assistants

50+ Past Collaborators

10+ visitors



Research Areas



Semantic e-Science
(Data Integration,
Semantic Grid)

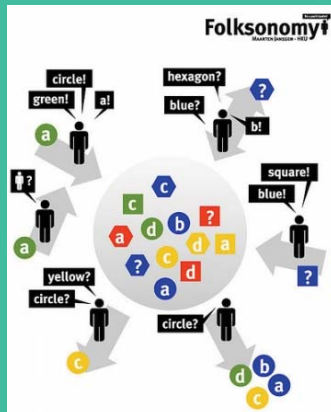
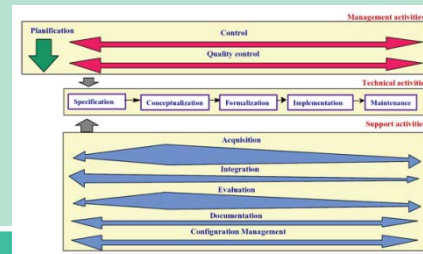
2004

Internet
of Things

2008



Ontological Engineering¹⁹⁹⁵



(Social)
Semantic
Web and
Linked Data

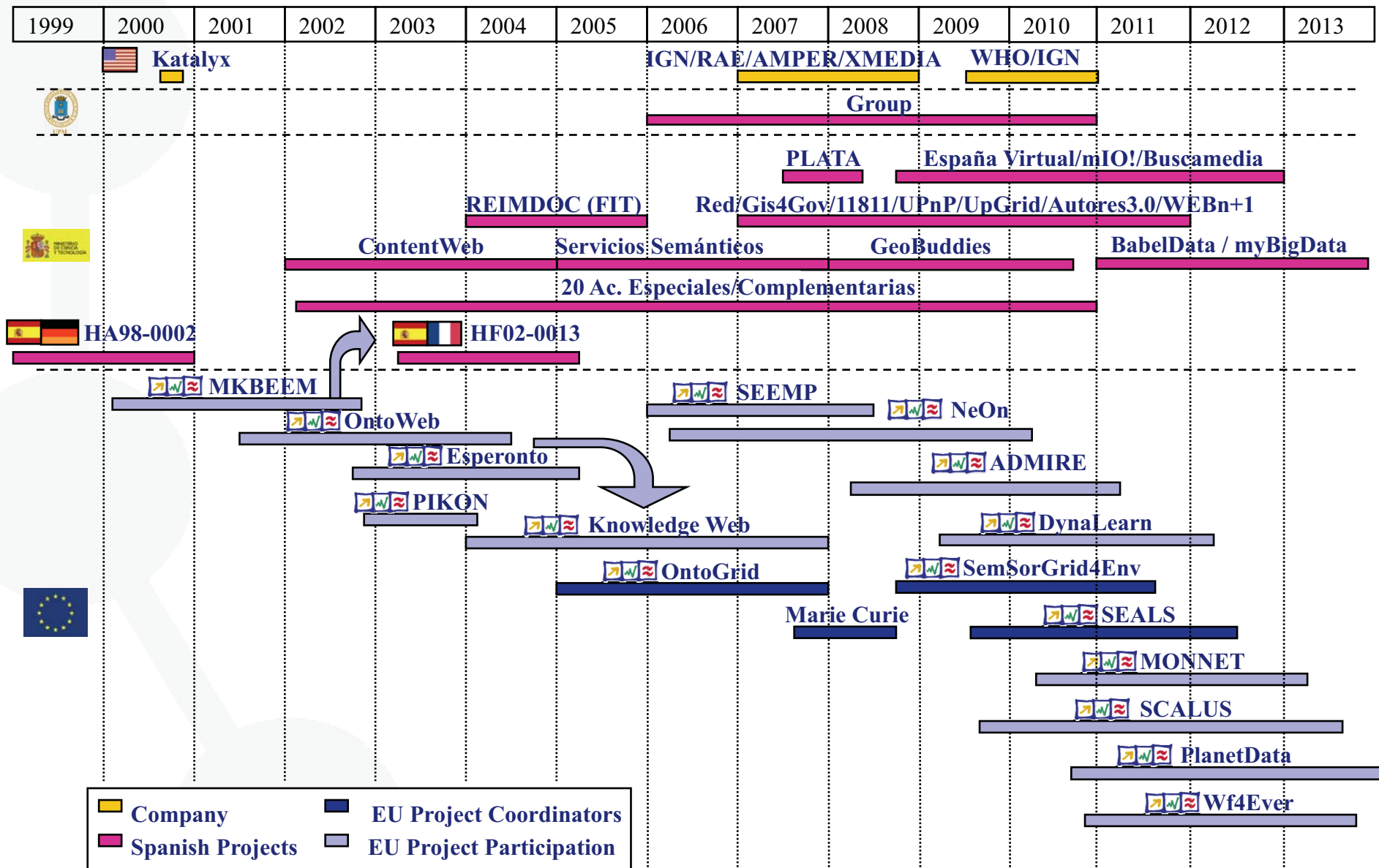
2000

Natural
Language
Processing

1997



> 30 Research projects



- Ontology Engineering Group
- **Library Linked Data and Motivation**
- datos.bne.es project
- MARiMbA
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- Apply Linked Data principles to library (and museums, and archives) data:
 - (1) Use URIs as names for things
 - (2) Use HTTP URIs so people can look up those names
 - (3) Provide useful information, using the standards (RDF*..)
 - (4) Include links to other URIs so that they can discover more things (not only sameAs links!)
- Growing interest from cultural institutions in the RDF data model, Linked Data, Open Data in general:
IFLA, Europeana LOD, CENL, Stanford Manifesto, W3C.. But why?



- Short-lived working group: around 1 year
- “**innovative ideas** for specifications, guidelines, and applications that are not (or not yet) clear candidates as Web standards”
- To **help** increase global interoperability of library data on the Web, by
 - **bringing together people** from **Semantic Web**, the **library community and beyond**,
 - **identifying collaboration tracks for the future.**

- 3 reports: Main report, Use Cases, Vocabularies and Datasets. (<http://www.w3.org/2005/Incubator/llid/>)
- **Main report:**
 - **Benefits**
 - Current situation
 - Recommendation
- **Use cases report:** +50 use cases
- **Vocabularies and datasets:** Practical overview of current resources.

- For **users**:
 - Improved discovery and browsing of data
 - Better visibility
 - Enriched publication
- For **organizations**:
 - Bottom-up approach to data publication → more actors, different views
 - Wider choice of technologies (not only ILS vendors)
 - Lower infrastructure costs
 - Get more accessible to developer communities
 - Embrace Open Standards
- For **curators**:
 - Up-to-date directly citable by catalogers (using URIs)
 - Reduce redundancy, and duplication
 - Curators can focus on their domain of expertise (re-use)

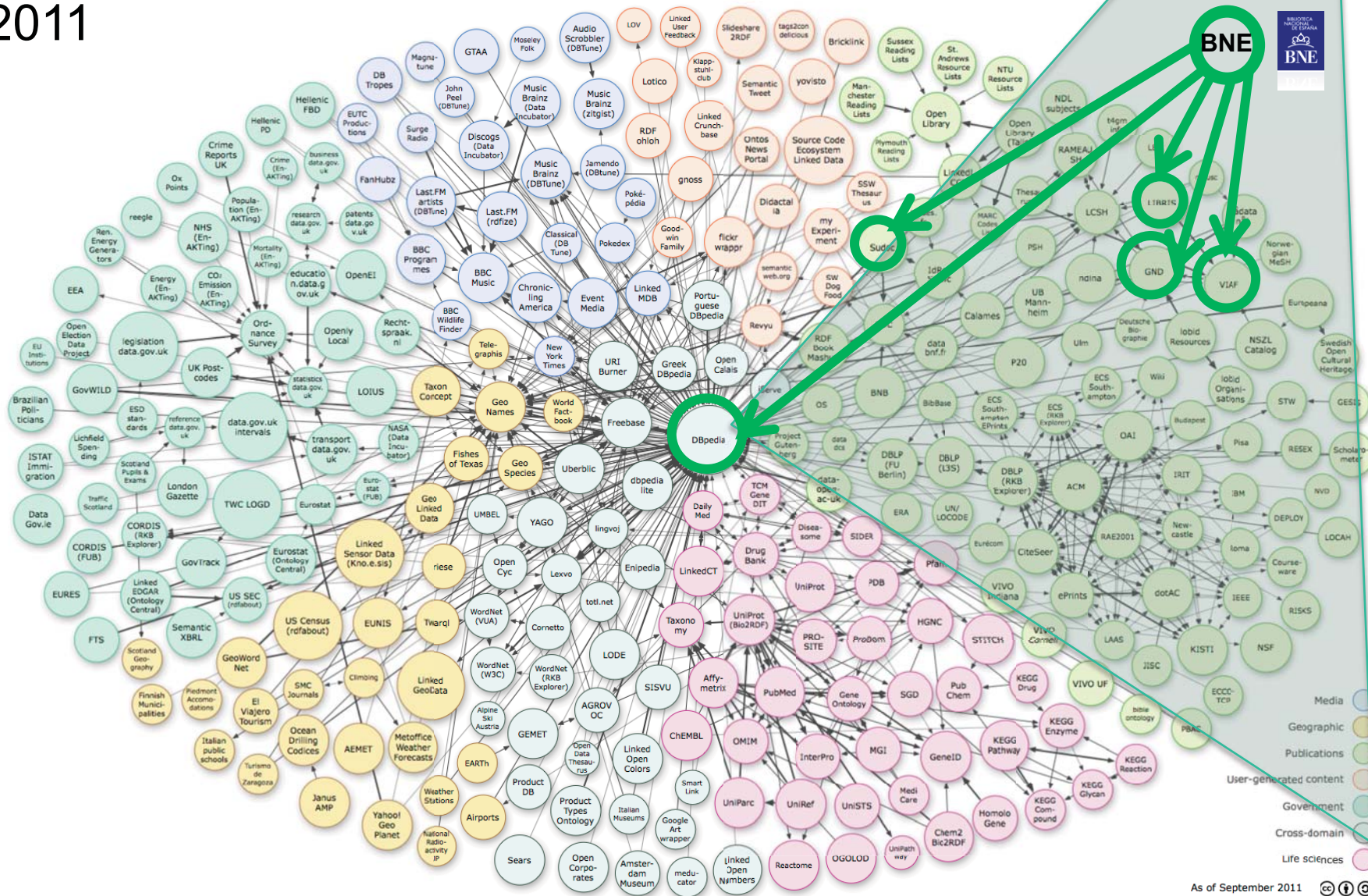
- Ontology Engineering Group
- Library Linked Data and Motivation
- **datos.bne.es project**
- MARiMbA
- Results and comparison

- Joint project between the National Library of Spain (BNE) and Ontology Engineering Group
- Started as a small proof-of-concept project: Publishing "Cervantes" Datasets as LD
- Evolved into a bigger project: Publishing a significant part of the BNE catalogue
- Published in December 2011, public announcement at BNE

2011



BNE



As of September 2011

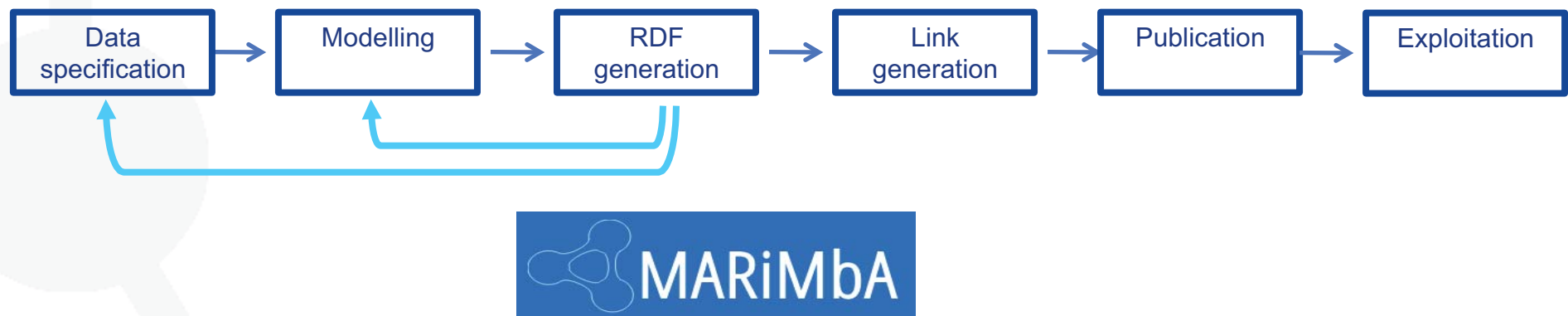
Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>

datos.bne.es: Initial requirements and issues

- **Source data:** MARC 21 records, not RDB. Very flat structure difficult to map to richer models
- Domain experts (catalogers) need to be part of the mapping process.
- Data quality good but still many errors: **reporting.**
- Iterative and incremental transformation process: **measure coverage and progress.**
- Highly specialized library models: FRBR, ISBD.
- Multilinguality, collaboration with IFLA

datos.bne.es: Methodological approach

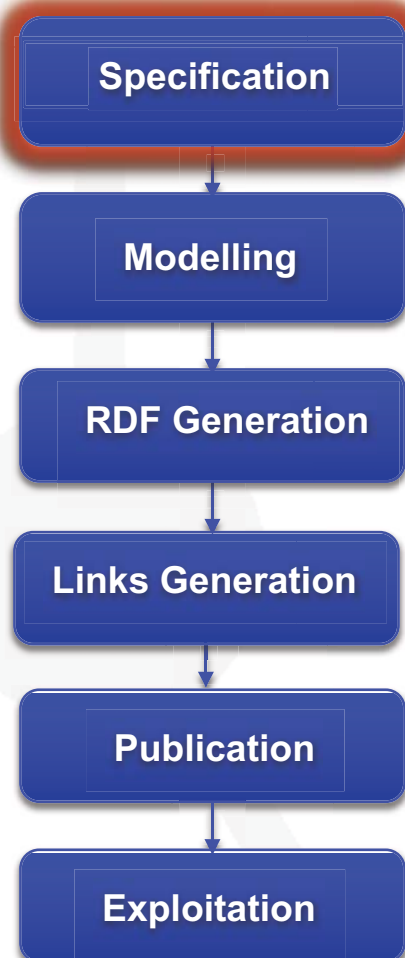
- Derived from several experiences at OEG: geolinkeddata.es, Met agency, etc. [1]



- Design principle: Have more control over the different activities, allow for iterative, incremental process

[1] **Villazón-Terrazas, B.** et al., Methodological Guidelines for Publishing Government Linked Data. In D. Wood, ed. Linking Government Data. Springer.

- Records in the **MARC 21** format
- **3.9 million** bibliographical records
- **4.2 million** authority records
- Version: November, 2011



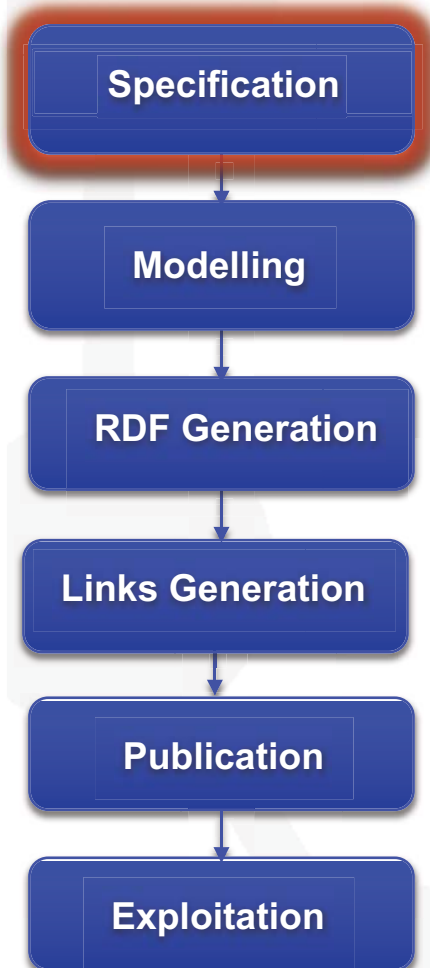
2492684	Personas
347737	Entidades
84381	Congresos
715131	Títulos
347793	Materia



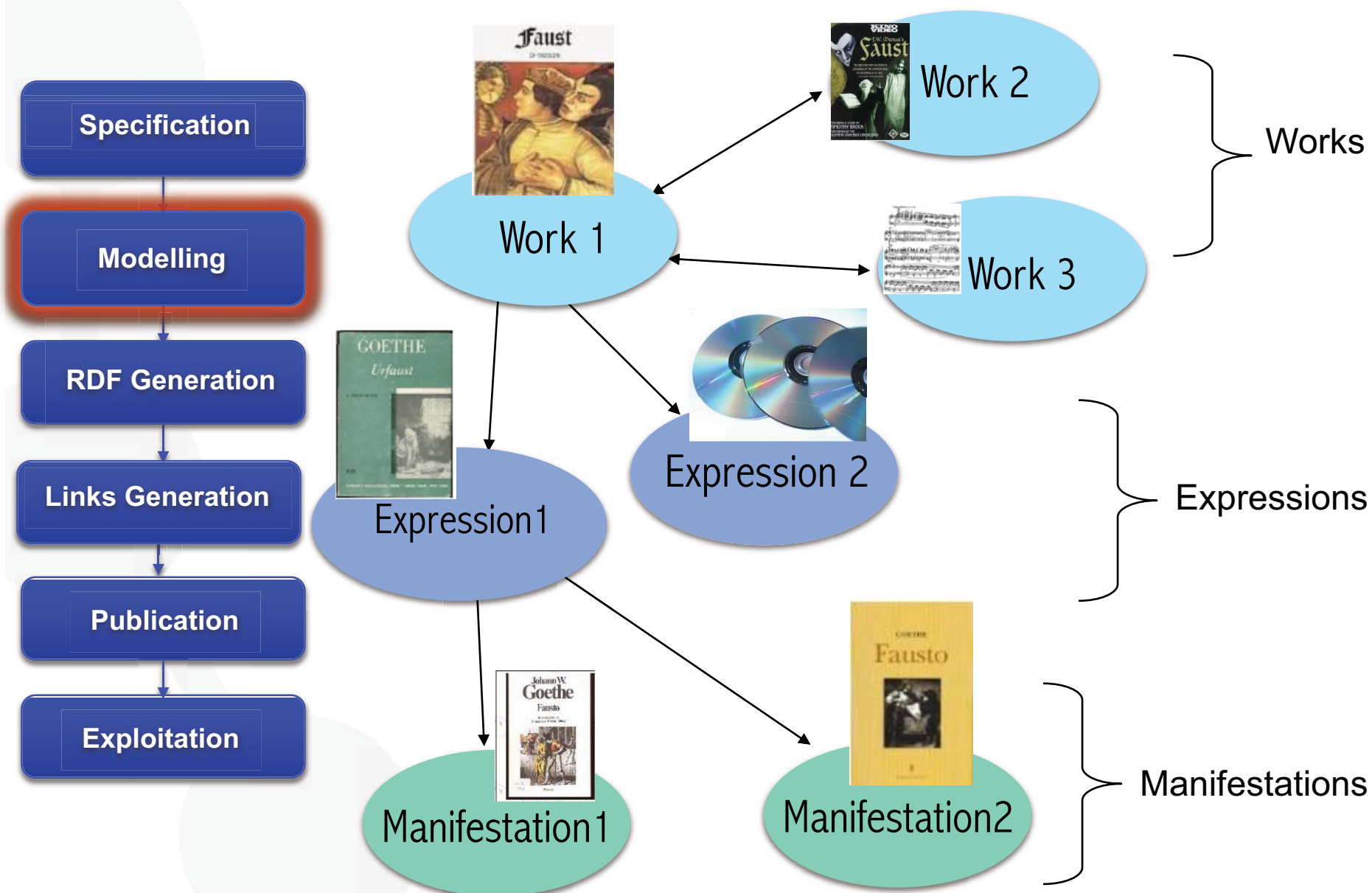
76576	Mapas
320727	Grabaciones sonoras
166017	Grabados, dibujos y fotografías
35770	Manuscritos
143959	Monografías antiguas
2696560	Monografías modernas
178473	Partituras
3021	Recursos electrónicos
156634	Publicaciones seriadas
96672	Videos

- Define here the characteristics of MARC21 records:

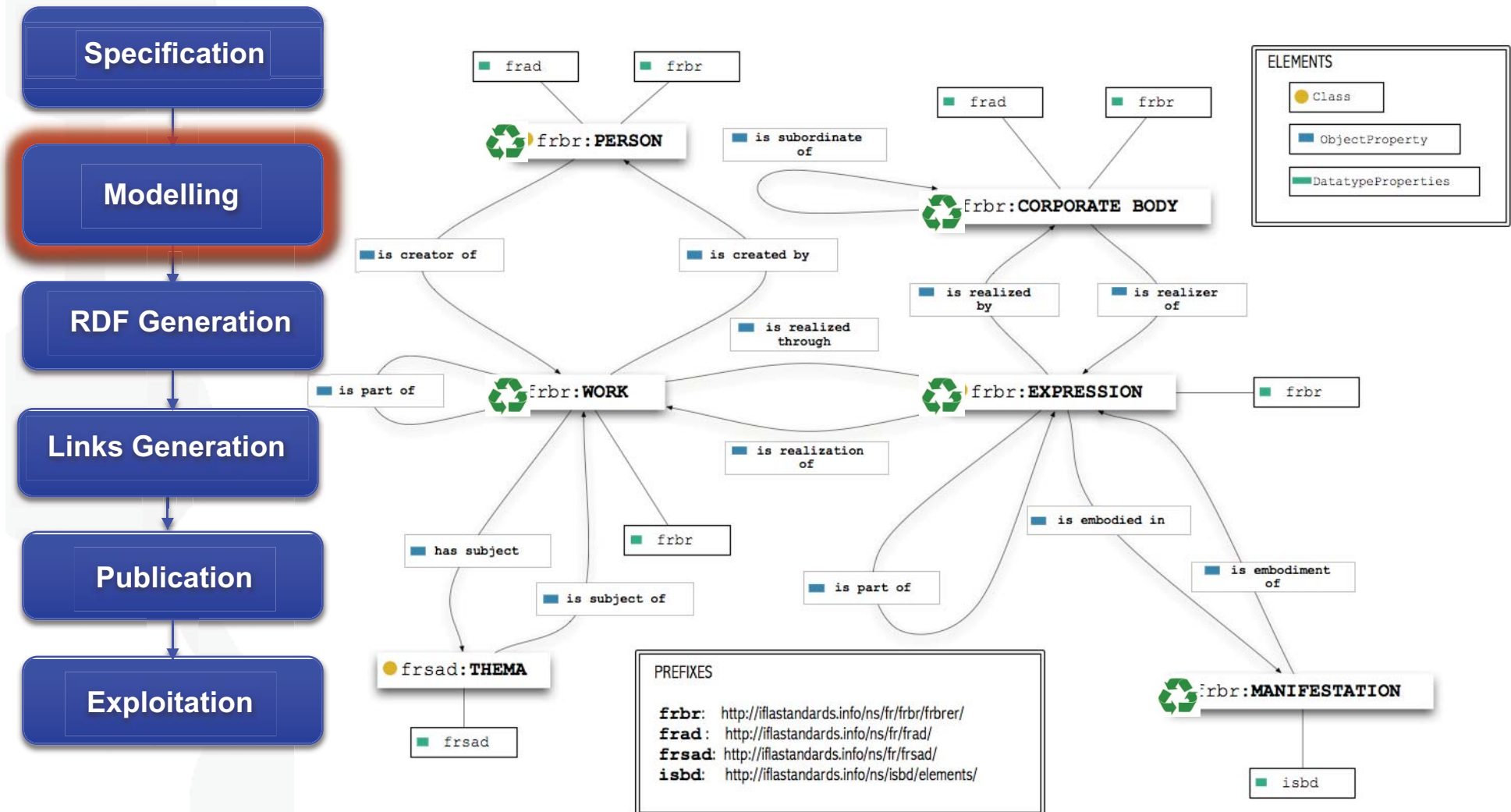
- Specialized format, complex structure
- Need for specialized tools
- ...



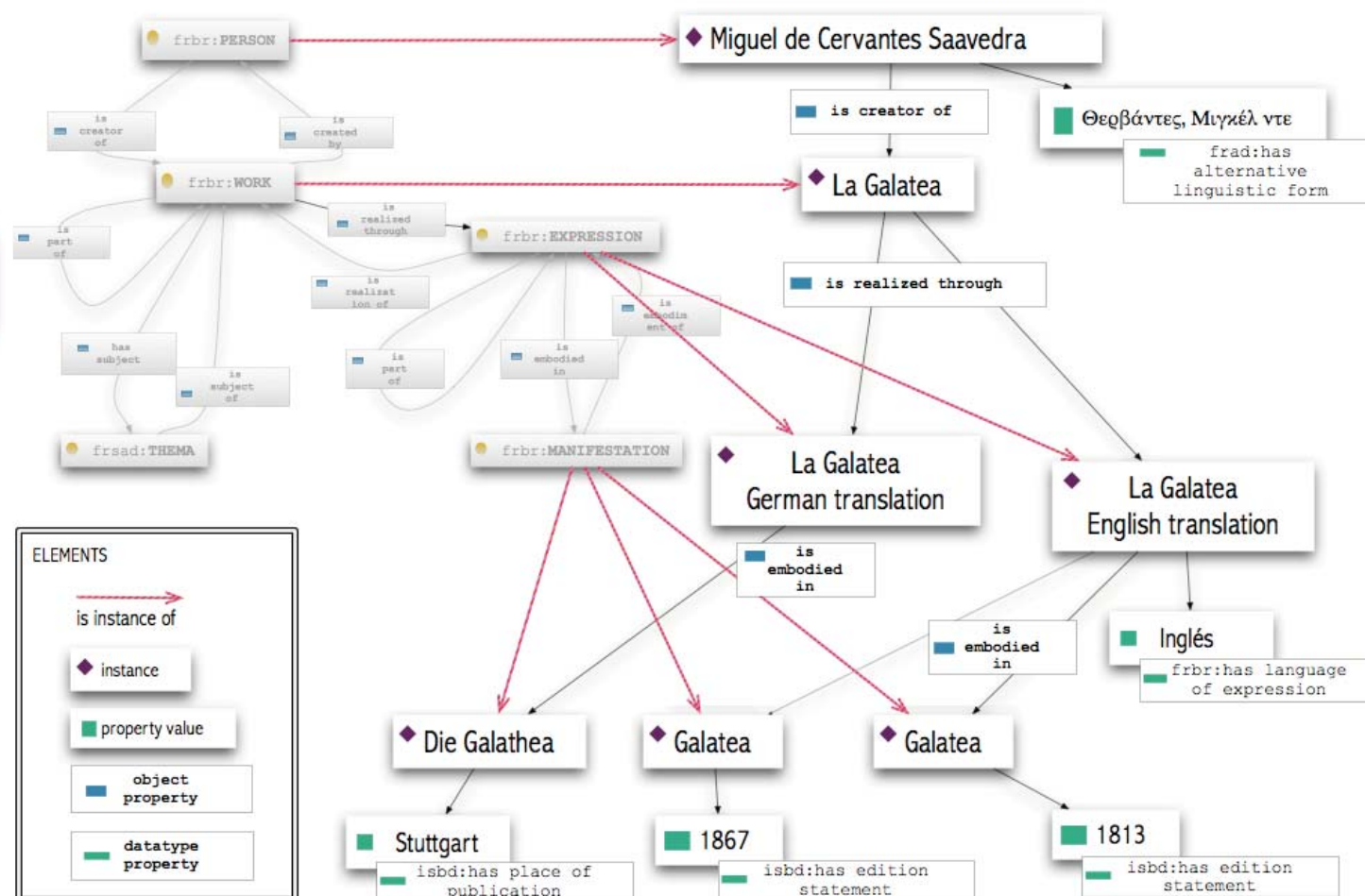
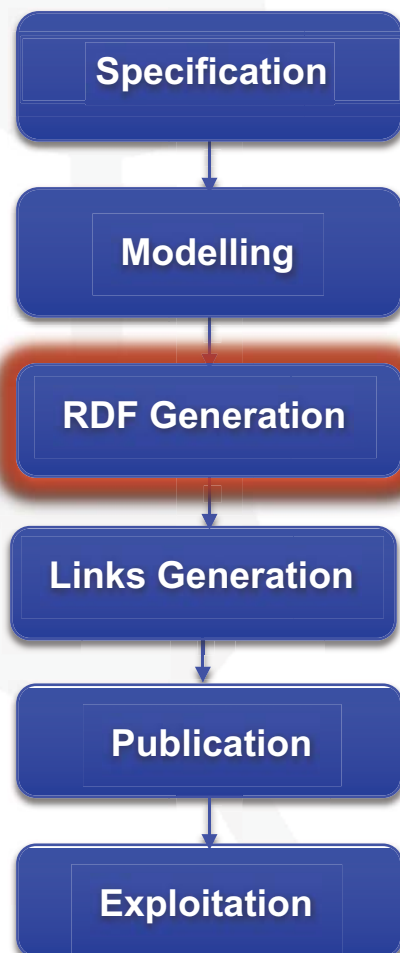
Model: FRBR at a glance



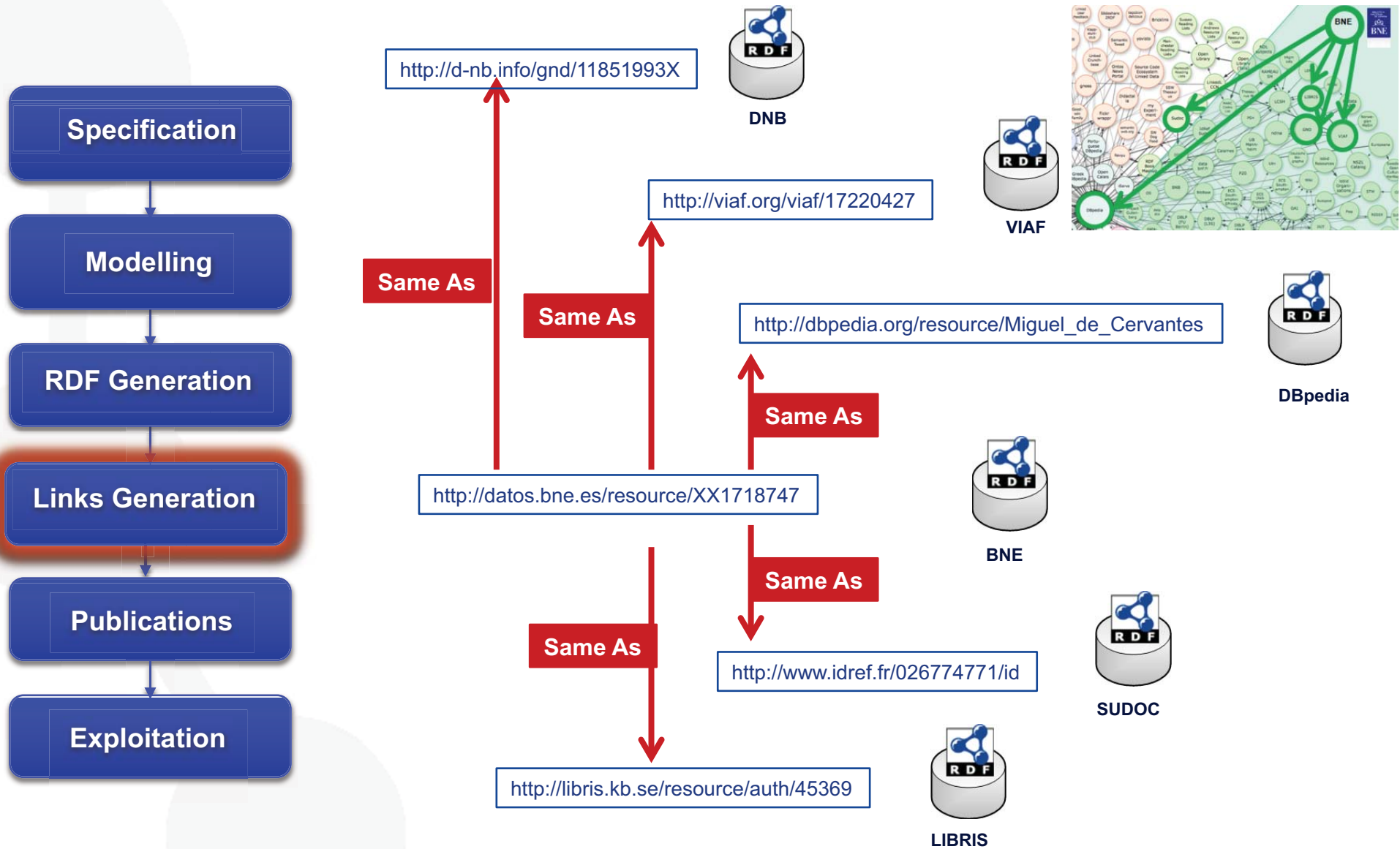
IFLA Vocabulary-based ontology

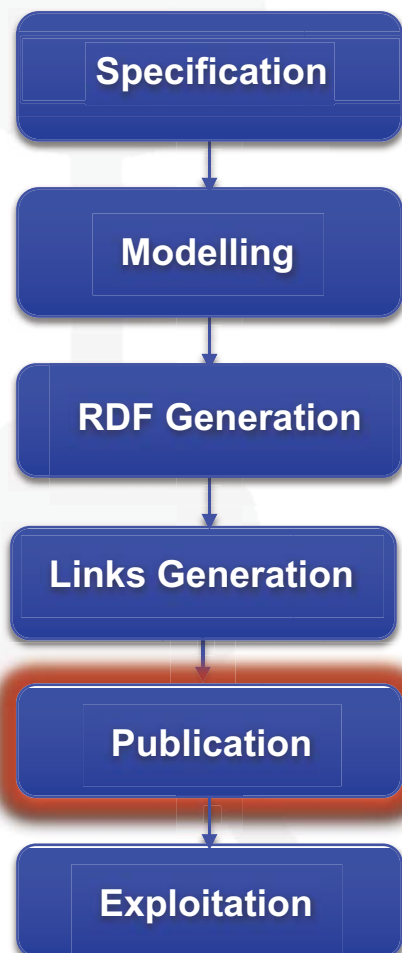


MARiMbA generates RDF using RDFS/OWL ontologies



MARiMbA links with other resources: VIAF, DNB, SUDOC, LIBRIS, DBpedia



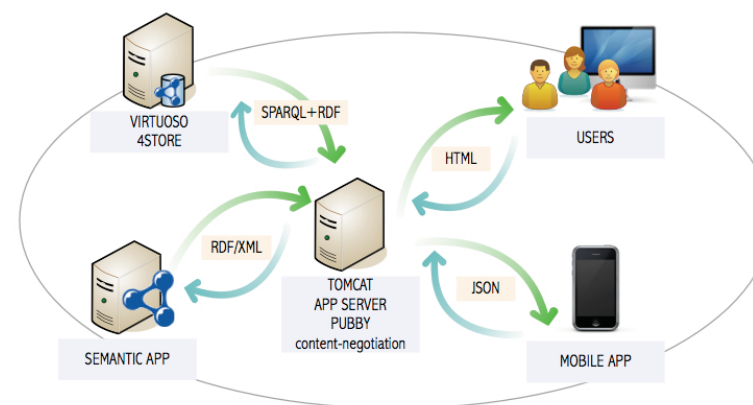


Data publication

Metadata publication using VOID

To facilitate the discovery

- Register in CKAN your dataset
- Use **sitemap4rdf** to generate the site map
- Upload the site map to **Google** and **Sindice**



Web Interface

Specification

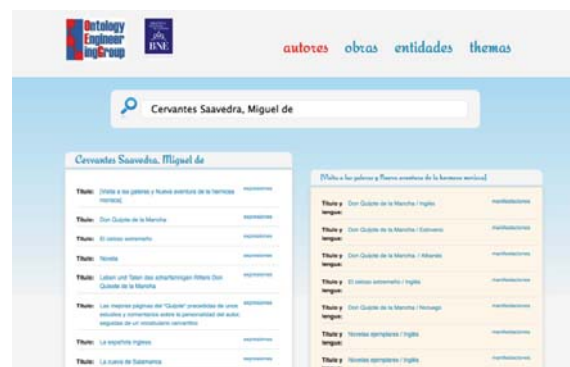
Modelling

RDF Generation

Links Generation

Publication

Exploitation



<http://linkeddata3.dia.fi.upm.es/bne-demo>

SPARQL Queries:

<http://datos.bne.es/sparql>

```
select distinct COUNT(?Obras) where {
```

```
http://datos.bne.es/resource/XX1718747
```

```
<http://iflastandards.info/ns/fr/frbr/frbrer/P2010>  
?Obras
```

URI Cervantes

Is author

- Ontology Engineering Group
- Library Linked Data
- W3C Library Linked Data Incubator Group
- datos.bne.es project
- **MARiMbA**
- Results and comparison

- "A MARC Mappings and RDF generator"
- Supports the ETL process by:
 - Analysing the source records.
 - Generating mapping templates (spreadsheets) based on the analysis, providing useful information to users (domain experts)
 - Transforming MARC records to RDF.
 - Providing a light-weight SPARQL endpoint to query/browse the resulting RDF (using FUSEKI).
- Three step process:



1. Analyse records and generate mapping templates



2. Assign mappings using mapping templates



3. Generate RDF and produce a report

- Machine-readable format widely used for representation and exchange
- Different communication formats:
 - **MARC 21 format for Bibliographic Data**
 - **MARC 21 format for Authority Data**
 - Others: Holdings, Classification, etc.
- Three main elements:
 - **Record structure:** ISO 2709. Fields, indicators, subfields...
 - **Content designation:** "Meaning" of codes and conventions
 - **Content:** Defined outside the MARC standard (ISBD, AACR..)

MARC21 record structure

- Authority record: Camus, Albert*

Control Field

001 XX1721208
 005 200012181124
 008 901120nn aijnnaabn n aaa
 016 \$a BNE19900178994
 040 \$a SpMaBN \$b spa \$c SpMaBN \$e rdc \$f
 embne

Field

Subfield

Content

100 10 \$a Camus, Albert

HEADING

Subfield

Content

\$d 1913-1960

1XX

670 \$a El mite de Sísif, 1987 \$b port. (Albert Camus)

670 \$a Dic. de filosofía, de J. Ferrater Mora, 1980 \$b (Camus., Albert (1913-1960); n. Mondovi, Argel)

670 \$a Aut. BN-OPALE, 1995 \$b (Camus, Albert)

* <http://datos.bne.es/resource/XX1721208>

MARC21 record content designation

- Authority record: Camus, Albert*

Control Number		001	XX1721208	
				HEADING – Personal
Personal name	Name	100	10 \$a	Camus, Albert
				Name
				100
Dates associated with name			\$d	1913-1960

- Human reading:
*An authority record that describes a **Person**,
named **Camus, Albert** with associated **dates**
1913-1960*

* <http://datos.bne.es/resource/XX1721208>

Mapping process intuitively

Classify

* Record **Heading**

*An authority record that describes a **Person**,
named **Camus, Albert** with associated **dates**
1913-1960*

Annotate

* **Field-subfield**
content

MARC 21 record (Input)	Action	RDF (Output)
100 \$a \$d	Classify	rdf:type foaf:Person
100 \$a Camus, Albert	Annotate	foaf:name "Camus, Albert"
100 \$d 1913-1960	Annotate	frbr:P3040 "1913-1960"

Mapping process more in detail

- **Classify:** Exploiting the heading field and subfield **codes**.

100 \$a \$d → Person (it has a personal name)

100 \$a \$d \$t → Work (it has a title)

- **Annotate:** Using subfield codes and the **content**.

100 \$a "Camus, Albert" → foaf:name "Camus, Albert"

100 \$t "La Peste" → frbr:workTitle "La Peste"

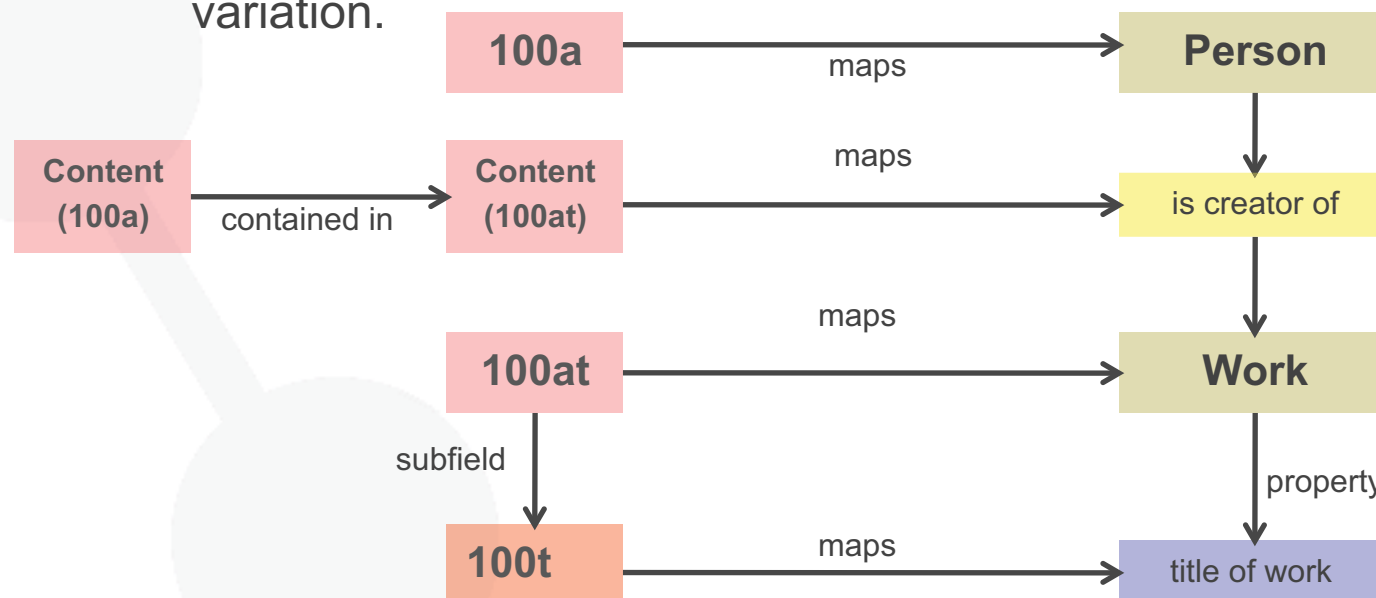
- **But,** what about the **relationships** between the entities?

The work "La Peste" was created by Albert Camus

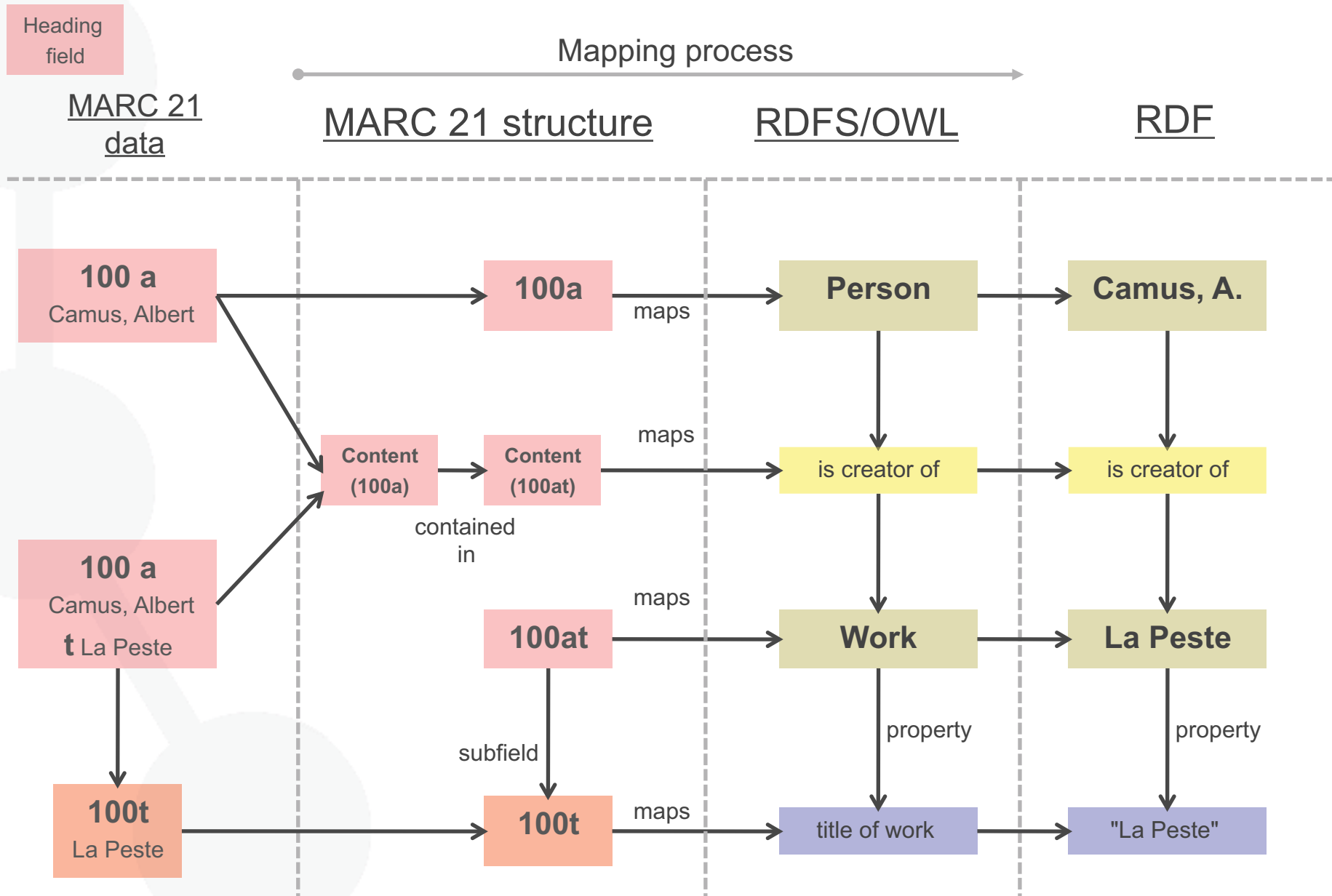
Let's see an example

Mapping process more in detail (to be refined)

- Similar to mapping ontologies, but:
 - **Classes:** Are defined in terms of the MARC heading field and subfield codes
100atl → Expression ; 110a → Corporate Body
 - **Properties:** Are defined in terms of field+subfield codes
100a → name ; 100t → title of work
 - **Object properties:** Are defined in terms of heading content containment + variation.



Mapping full example with record and instance data



Mapping process more in detail

- Relationships between records are **not explicit** in MARC.

Goal: The work "La Peste" was created by Albert Camus

R1: Camus, Albert record

```
001 XX1721208  
  
100 10 $a Camus, Albert $d 1913-1960  
Common
```

Person

R2: La Peste record*

```
001 XX1910518  
  
100 10 $a Camus, Albert $d 1913-1960 $tLa peste  
Common Diff
```

Work

We know the type of R1 and R2, and we look at the heading diff

```
bne:XX1721208 frbr:isCreatorOf bne:XX1910518
```

* <http://datos.bne.es/resource/XX1910518>

Mapping process summary

(MARC records)

1. Classify

001 XX1721208
100 10 \$a Camus, Albert \$d 1913-1960

001 XX1910518
100 10 \$a Camus, Albert \$d 1913-1960 \$t La peste

bne:XX1721208 a **frbr:Person**

bne:XX1910518 a **frbr:Work**

2. Annotate

bne:XX1721208 a frbr:Person
frbr:name "Camus, Albert" .
frbr:hasDates 1913-1960

bne:XX1910518 a frbr:Work
frbr:title "La Peste"

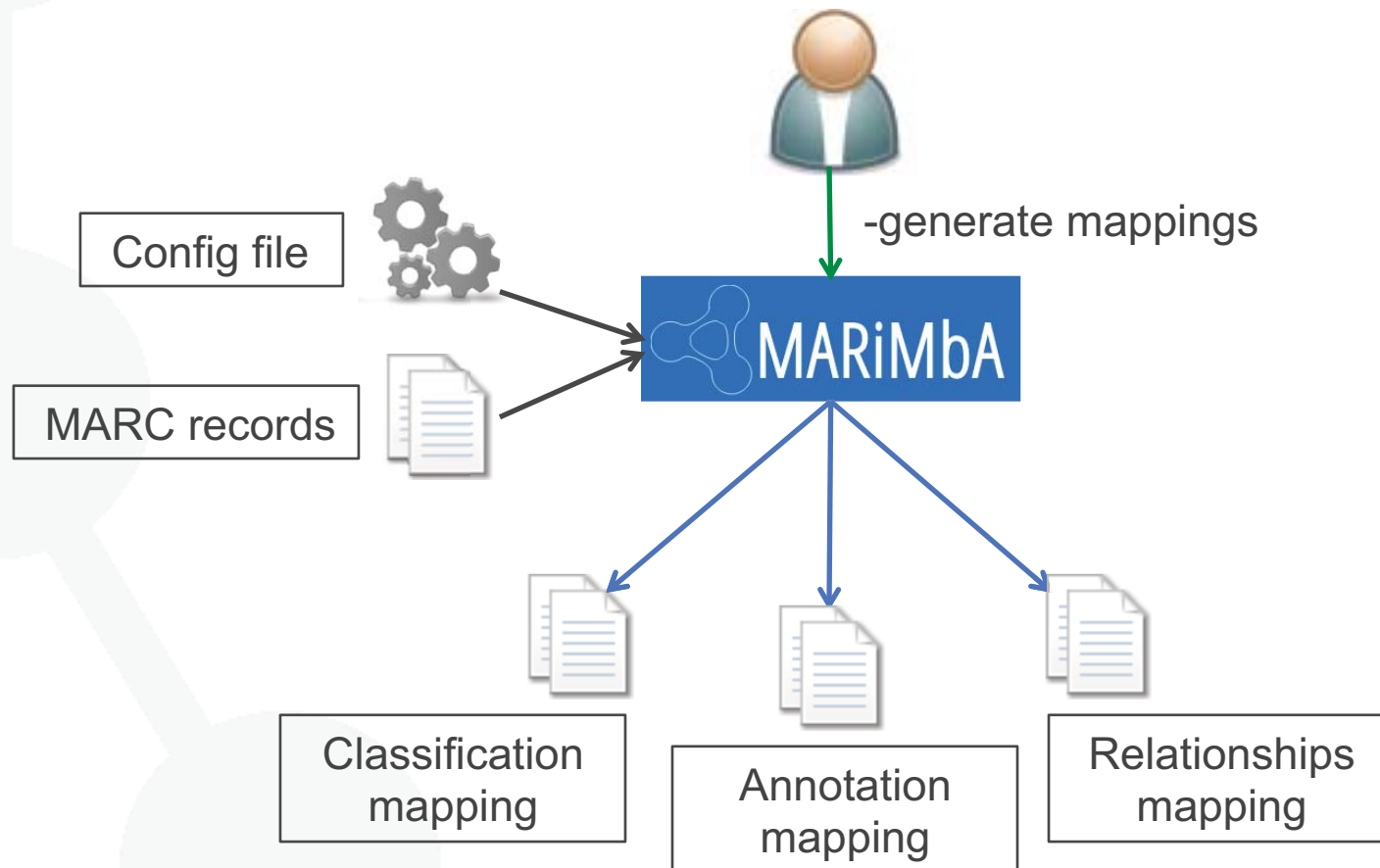
3. Relate

bne:XX1721208 a frbr:Person
frbr:name "Camus, Albert" .
frbr:hasDates 1913-1960 .
frbr:isCreatorOf bne:XX1910518

bne:XX1910518 a frbr:Work
frbr:title "La Peste" .
frbr:isCreatedBy bne:XX1721208

MARiMbA step 1: Analysis and template generation

- 3 steps of mapping **Classify, Annotate, Relate**
→ 3 CSV templates based on the source data



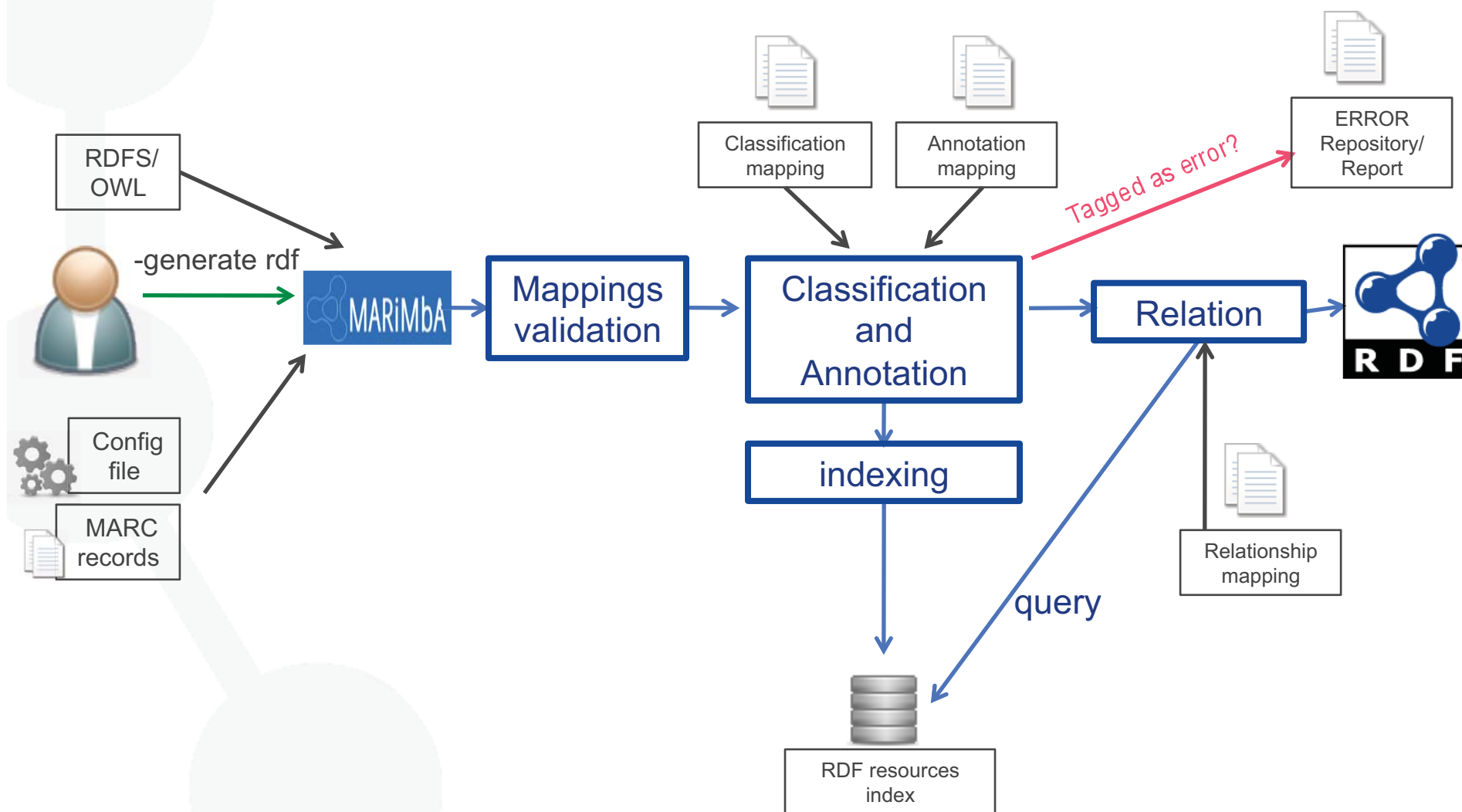
MARiMbA step 2: Assign mappings

Three spreadsheets:

	A	B	C	Classification mapping	Mapping value
1	Combination	Records count	Example		Person
2	a	881115	[\$aYcardo, Maruja]		Work
3	at	685861	[\$aGual, Adrià, \$t Donzell qui cerca muller]		
	A	B	C		
1	Combination	Records c	Example		Mapping value
2	260b	3892943	Imp. Lemerrier et C.ie		http://iflastandards.info/ns/isbd/elements/P1117
3	245a	3871272	Polka elegante para piano		http://iflastandards.info/ns/isbd/elements/P1004
4	040a	3870286	SpMaBN	Annotation mapping	
5	260a	3845589	[Paris		http://iflastandards.info/ns/isbd/elements/P1016
6	300a	3827202	2 p.		http://iflastandards.info/ns/isbd/elements/P1022
7	245h	3751432	Música impresa		http://iflastandards.info/ns/isbd/elements/P1185
8	260c	3714336	1865-1869]		http://iflastandards.info/ns/isbd/elements/P1018
9	300c	3526395	22 cm		http://iflastandards.info/ns/isbd/elements/P1024
10	016a	3103593	bipaBNE20070006028		

	A	B	C	D
1	Variation	Sample	Relationship	
2	n	Sociedad Didáctico-Musical Método especial de solfeo cor	frbr:P2057; frbr:P2058	
3	o	Bach, Johann Sebastian 1685-1750 Partita laúd		
4	p	Iglesia Católica Synodus Episcoporum (2008) Verbum Dor	frbr:P2057; frbr:P2058	
5	q	Isabel María Isabel María López Campos The face		
6	r	Chopin, Fryderyk 1810-1849 Valses piano mi menor	Relationships mapping	
7	s	Beethoven, Ludwig van 1770-1827 Fantasien pia		
8	t	Castellà Andreu, Josep M. La función constituci		

MARiMbA step 3: RDF generation process overview

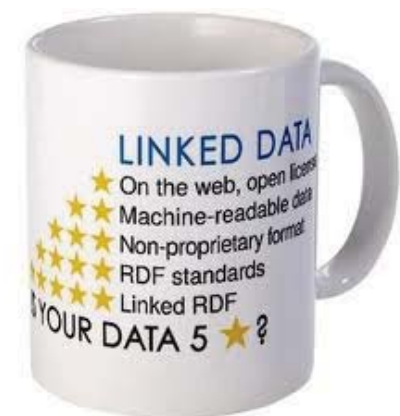


Open (Research) questions

- Areas for effective automation:
 - **Classification** phase: Learning algorithms seem good candidates (we have well curated training data).
 - **Relate** phase: Blocking strategies, string similarity metrics
 - **Metadata content granularity**: Can we derive mapping rules directly from models (e.g. ISBD) or cataloguing rules (e.g. AACR)?
- Curation workflow/feedback:
 - Can we define a protocol for continuous improvement of data through the ETL process? Metrics? QA?
 - Can mapping rules and cataloguing rules be used to automatically validate resources?
- Update process:
 - Protocol for incremental updates, changes propagation.
- Linking to external resources: techniques for cross-lingual instance matching

- Ontology Engineering Group
- Library Linked Data
- W3C Library Linked Data Incubator Group
- datos.bne.es project
- MARiMbA
- **Results and comparison**

- Total number of authority records: **4.100.000**
- Total number of bibliographical records: **2.390.140**
- Total number of RDF triples: **58.053.215**
- Number of links: (15% authorities): **587.520**
- Linked sources:
 - VIAF
 - SUDOC (French collective university catalogue) FR
 - GND (German National Library of authorities) GER
 - LIBRIS Sweden
 - DBPedia
 - Soon BNF



Tools comparison

Feature	Metamorph (DNB)	Marc2rdf (NO)	MARiMbA (BNE)
Users	API, technical users	YAML mapping language	Librarians Catalogers
Formats	Authority, Bibliographic	Bibliographic	Authority, Bibliographic
Encodings	MARC, PICA+	ISO	ISO, MARCXML
Granularity	Record content designation	Content transformation	Record content designation
Source data coverage	Not controlled	Not controlled	Covers all possibilities through analytic. process
Error reporting	NO	NO	Limited
Degree of Automation	Limited	Limited	Limited
Complex linking	NO	NO	Yes

Datasets comparison (initial review)

Feature	DNB	BNF	BNE
Data	Authority, Bibliographic	-Authority +Bibliographic	Authority, Bibliographic
Source Data	MARC, PICA+	MARC	MARC
Granularity	++	++	+
Source data coverage	unknown	unknown	High
Degree of links between resources	Low, almost flat resources	Medium	High
Update	Automatic	Unknown	Bulk transformation
Complex linking	NO	NO	Yes

Thank you very much!

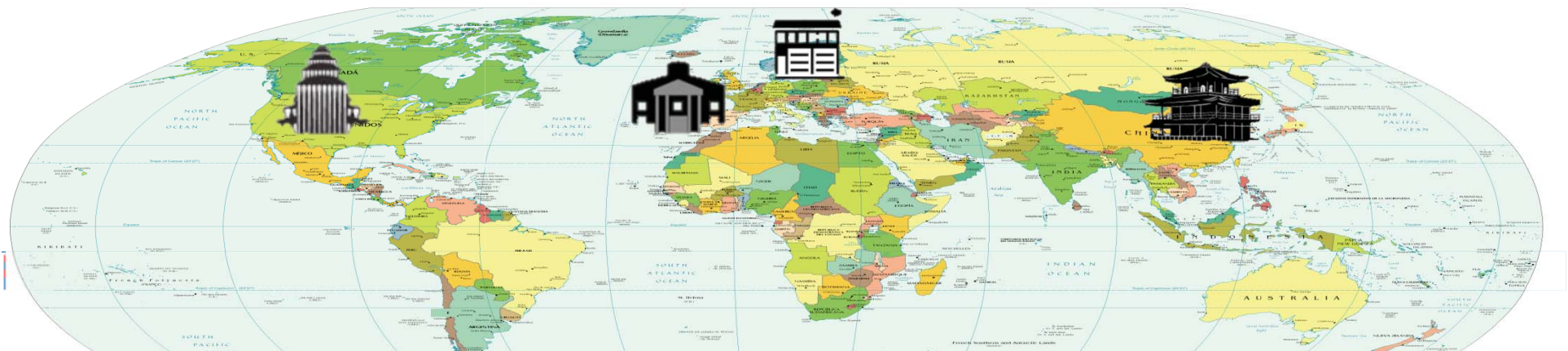
Questions and comments are very welcomed

Email: dvila@fi.upm.es

Acknowledgements

Who had translated “Quixote” to other languages?

- Multiple sources of multilingual data
- The local information may be incomplete
- The remote information is not available



Complex queries on different data sources

How many works written by Miguel de Cervantes are registered to the BNE and to the DNB?



Google

traducción del Quijote al hebreo biblioteca nacional de españa

Búsqueda

Aproximadamente 15.600 resultados (0,18 segundos)

- Todo
- Investigaciones recientes sobre la literatura en el Siglo de Oro... - Re...
- Imágenes
- Alain Bâque - 2006 - Literary Criticism - 340 páginas
- Maps
- ... en la Biblioteca Nacional), Madrid, Biblioteca Nacional de España. ... Hebreo de Jerusalén) «El Quijote en hebreo. Sus traducciones y adaptaciones». ...
- Videos
- Don Quijote de la Mancha - Wikipedia, la enciclopedia libre
- es.wikipedia.org/wiki/Don_Quijote_de_la_Mancha
- Noticias
- País, Bandera de España ... Quijote en español; 10.7 Don Quijote en guerra; 10.8 Don Quijote en hebreo; 10.9 Don Quijote en ... El cura del lugar somete la biblioteca de don Quijote a un expurgo, y quema parte de los libros que le han hecho tanto mal. ... Los ingleses, desde 1612 en la traducción de Thomas Shelton. ...
- Shopping
- Libros
- Más
- Amadís de Gaula, 1508:
- www.uctm.es/informatica/personales/_/DossierAmadis.pdf
- Formato de archivo: PDF/Adobe Acrobat - Vista rápida
- de C Culturales
- 12 Oct 2008 - Organizan: Biblioteca Nacional de España y Sociedad Estatal de ... todos los tiempos: Don Quijote de la Mancha. Pero no hemos de ... escasos ejemplares de la traducción del primer libro del Amadís de Gaula al hebreo. ...
- La Web
- Páginas en español
- Páginas de España
- Páginas extranjeras traducidas
- Más herramientas
- TORREIGLESÍAS
- www.torreiglesias.com/archivo/ayto-noticias/lexpoquijote/lexpo.htm
- El Quijote, después de la Biblia, es el libro más traducido ... Biblioteca de José Manuel Lucía Megías ... que terminó publicando la Edición Nacional para celebrar el XXV aniversario de la Paz española ... Traducción del Quijote al hebreo, realizada por Beatriz Skrotsky-Landau y Luis Landau, realizada por 1994. ...

Catálogo BNE <http://www.bne.es/>

Información de la biblioteca

Web de la BNE

Selección del catálogo

Contacto con la BNE

Buena del Catálogo

Servicios en línea

Colecciones especiales

Colecciones Digitales

Autenticación

Bibliografía Española

Otros recursos

Resultados de la búsqueda

Resultados no ordenados porque la búsqueda recuperó más de 900.

"Cervantes Saavedra, Miguel de 1547-1616" la búsqueda recuperó 974 Registros bibliográficos.

Páginas << 1 2 3 4 ... 100 ... 974 >>

#1	XXI(39933-3)	1997
Detalles	Hilpessomj idafgo Don Kihot Lamanahkij. Tol a [Texto impreso]	
Cerrar	Cervantes Saavedra, Miguel de 1547-1616	
	1 ejemplar disponible en Sede de Reservas en Sala General	
#2	12/14771	2001
Detalles	Paseo y entremeses [Texto impreso] 1ª ed.	
Cerrar	Maria Martínez, Juan María	
	8 ejemplares disponibles en Sede de Alacá	
#3	CERVIC/1/34	1905
Detalles	Homenaje a Cervantes [Texto impreso]	
Cerrar	Cervantes Saavedra, Miguel de 1547-1616	
	No hay ejemplares disponibles actualmente.	
#4	12/105448	2011
Detalles	La ghesalia [Texto impreso]	
Cerrar	Cervantes Saavedra, Miguel de 1547-1616	
	2 ejemplares disponibles en Sede de Alacá	

<http://www.viaf.org/>

VIAF

Fichero de Autoridades Virtual Internacional

Búsqueda

Seleccione campo

Seleccione índice

Términos de búsqueda

Búsqueda

Cervantes Saavedra, Miguel de 1547-1616

Cervantes, Miguel de, 1547-1616

De Cervantes Saavedra, Miguel

Сервантес Саведра, Мигель Де, 1547-1616

1547-1616 מִיגֶל דֵּה סַבְוֵדָרָה

VIAF ID: 17220427 (Personal)

Formas preferidas

100 1 - 1a Cervantes Saavedra, Miguel de, 1547-1616

100 1 - 2a Cervantes Saavedra, Miguel de, 1547-1616

100 1 - 3a Cervantes Saavedra, Miguel de, 1547-1616

100 2 - 1a Cervantes Saavedra, Miguel de, 1547-1616

100 1 - 2a Cervantes Saavedra, Miguel de, 1547-1616

100 1 - 3a Cervantes Saavedra, Miguel de, 1547-1616

DEUTSCHE NATIONALBIBLIOTHEK

English Kontakt A-Z Förderer Datenschutz Impressum Hilfe Mein Konto

KATALOG DER DEUTSCHEN NATIONALBIBLIOTHEK

Gesamter Bestand

Musikarchiv

Exilsammlungen

Buchmuseum

Suchformular zurücksetzen

Finden

<http://d-nb.info/gnd/11851993X>

Link zu diesem Datensatz

Person

Cervantes Saavedra, Miguel de (männlich)

Andere Namen

Cervantes Saavedra, Miguel de

Cervantes, ...

Cervantes-Saavedra, Miguel de

Cervantes Saavedra, Miguel

Cervantes Saavedra, Miguel

Cervantes Saavedra, Miguel

Cervantes, Miguel

Cervantes, Michéle

Cervantes, Michel de

Saavedra, Miguel de Cervantes y

Cervantes y Saavedra, Miguel de

Saavedra, Miguel de C.

Aktionen

In meine Auswahl übernehmen

Druckansicht

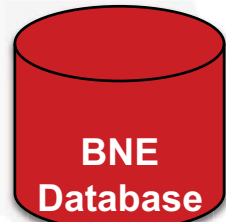
RDF/XML-Repräsentation dieses Datensatzes

Dokumentation Linked Data

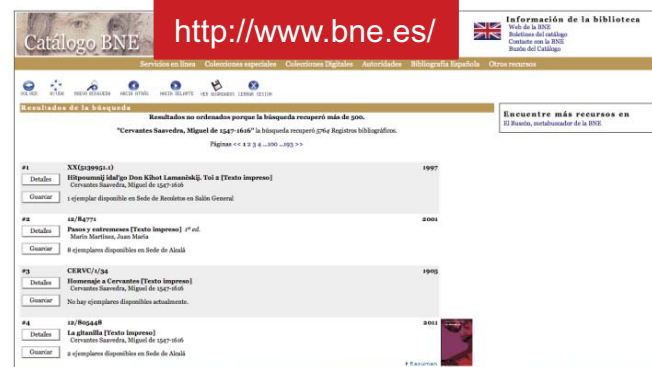
Korrekturanfrage

Zugehöriger Artikel in Wikipedia

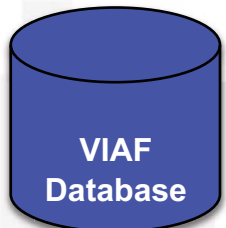
Data from different libraries exposed via Web



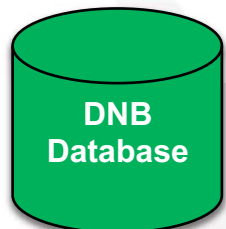
BNE
Database



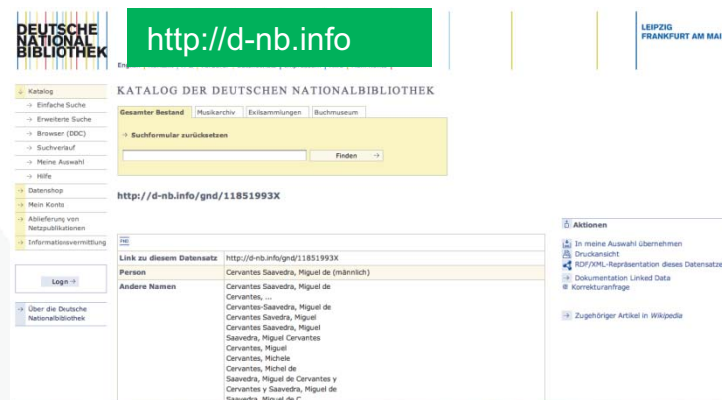
How many works written by Miguel de Cervantes are registered to the BNE and to the DNB?

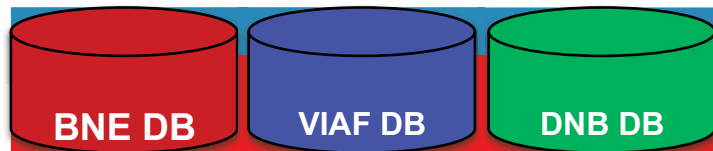


VIAF
Database

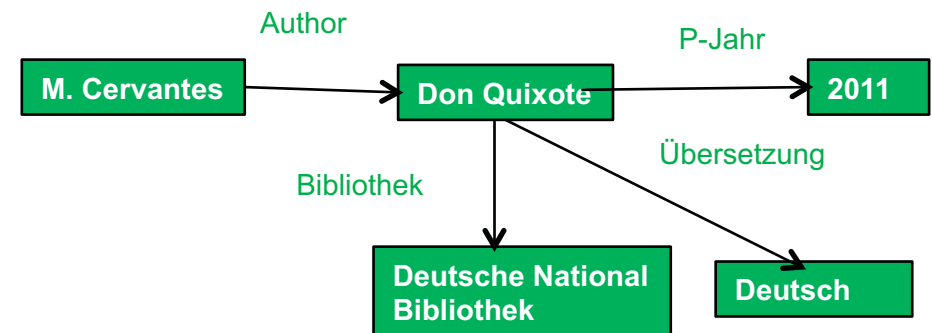
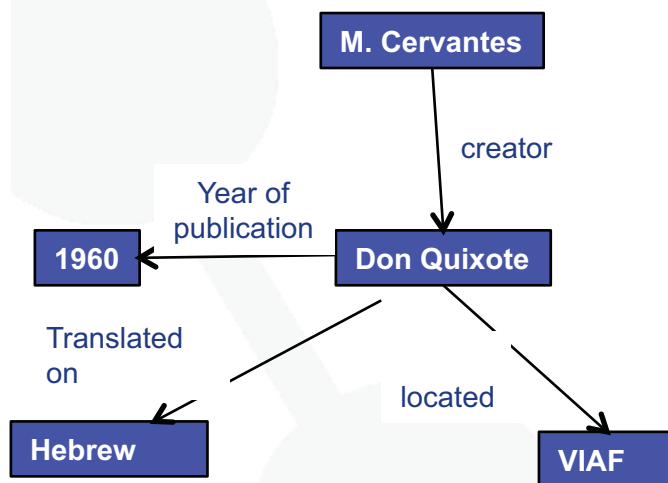
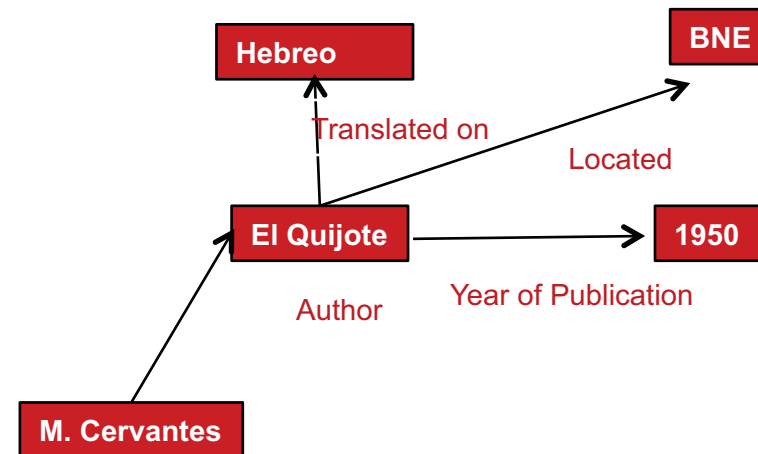
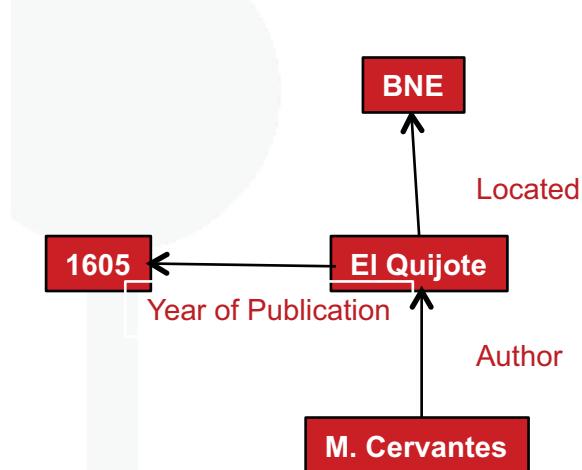


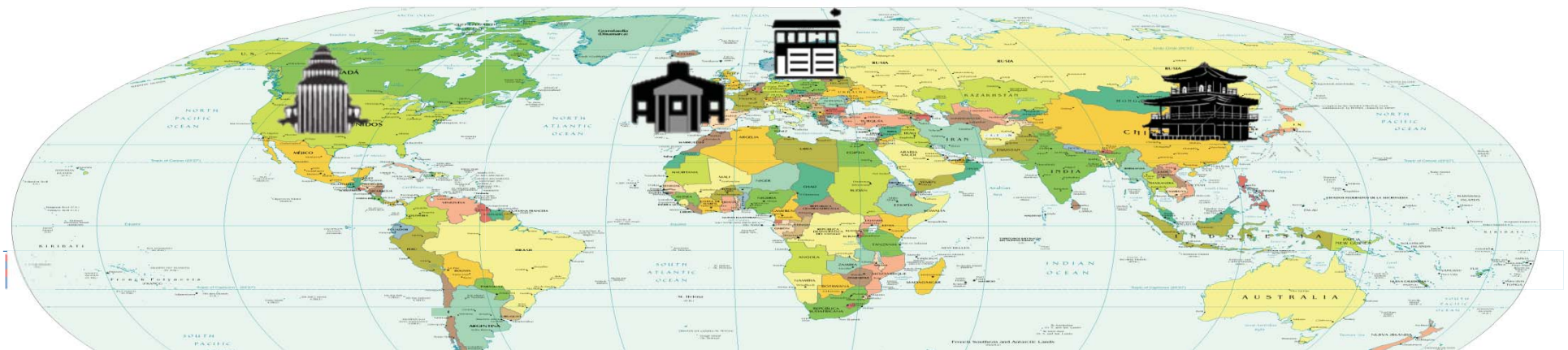
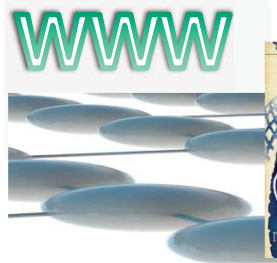
DNB
Database





Data integration





1. The concept from an intuitive manner
2. Fundamentals
3. The process
4. Marimba
5. Demo
6. Conclusions

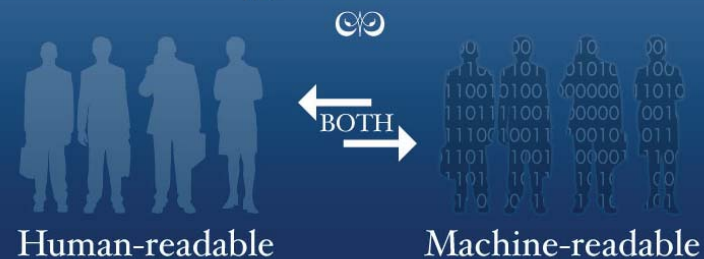
Usefulness of Linked data

- To combine data
 - From heterogeneous sources
 - In different formats
 - With different levels of detail
 - In different languages
 - From different countries
- To facilitate data integration



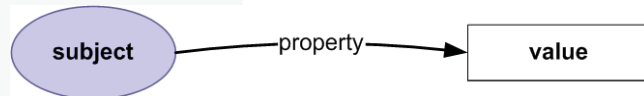
W3C

Choosing *How* to Publish



© Slide adapted from “5min Introduction to Linked Data”- Olaf Hartig

RDF(S) Models



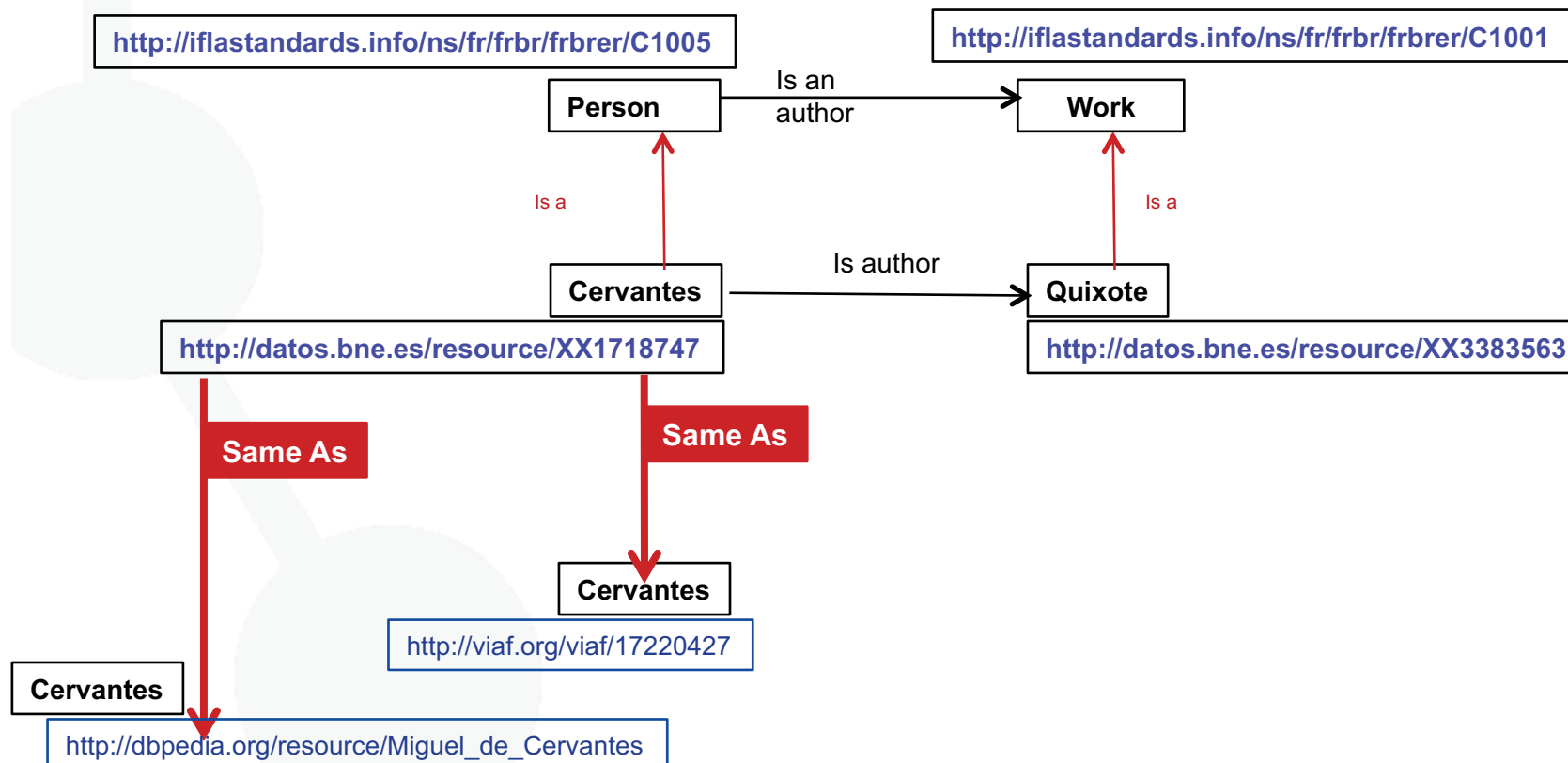
Unique Identifiers: URI

Identify a name or a resource on the Web

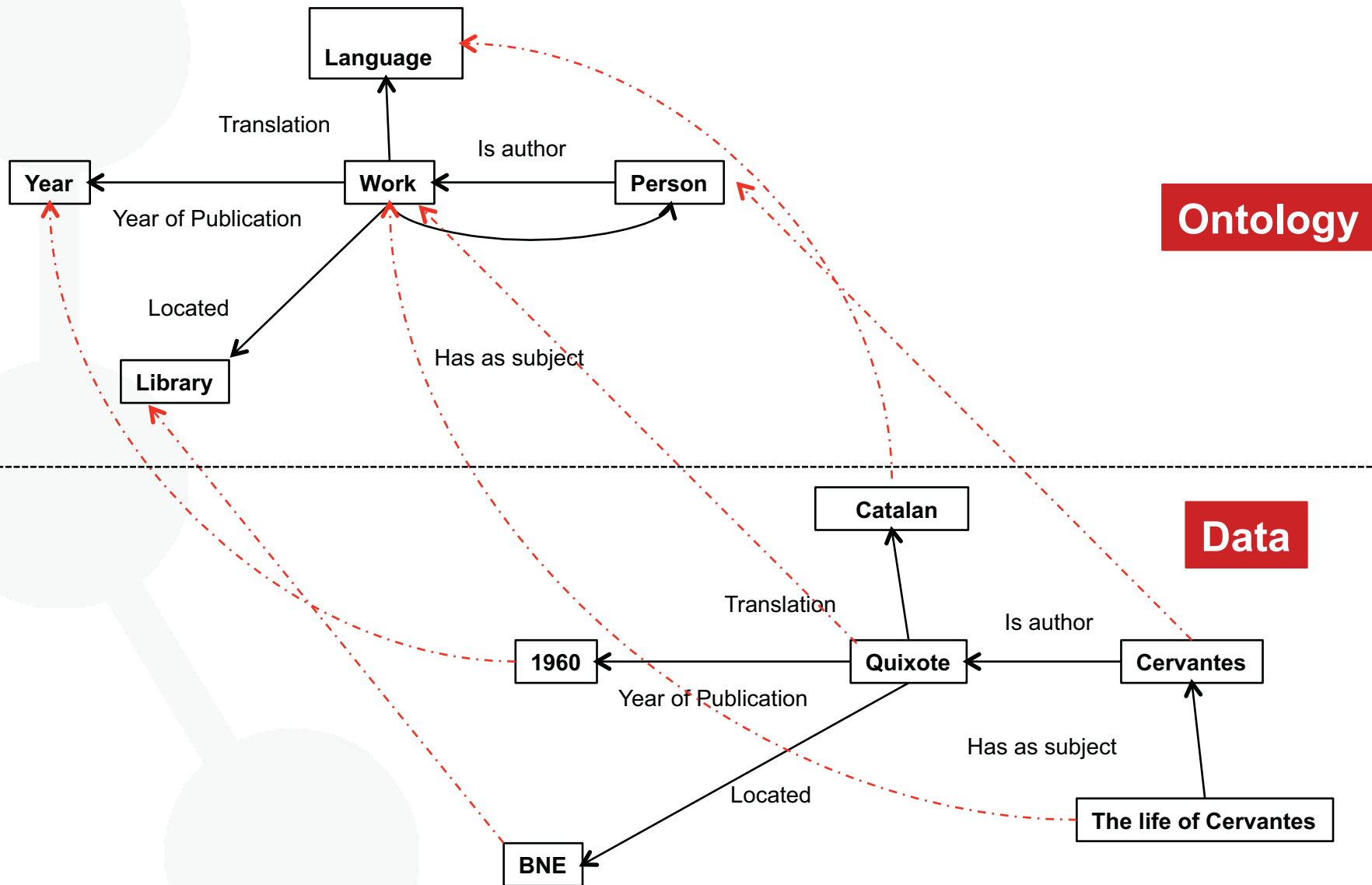
Link to other data

Same As

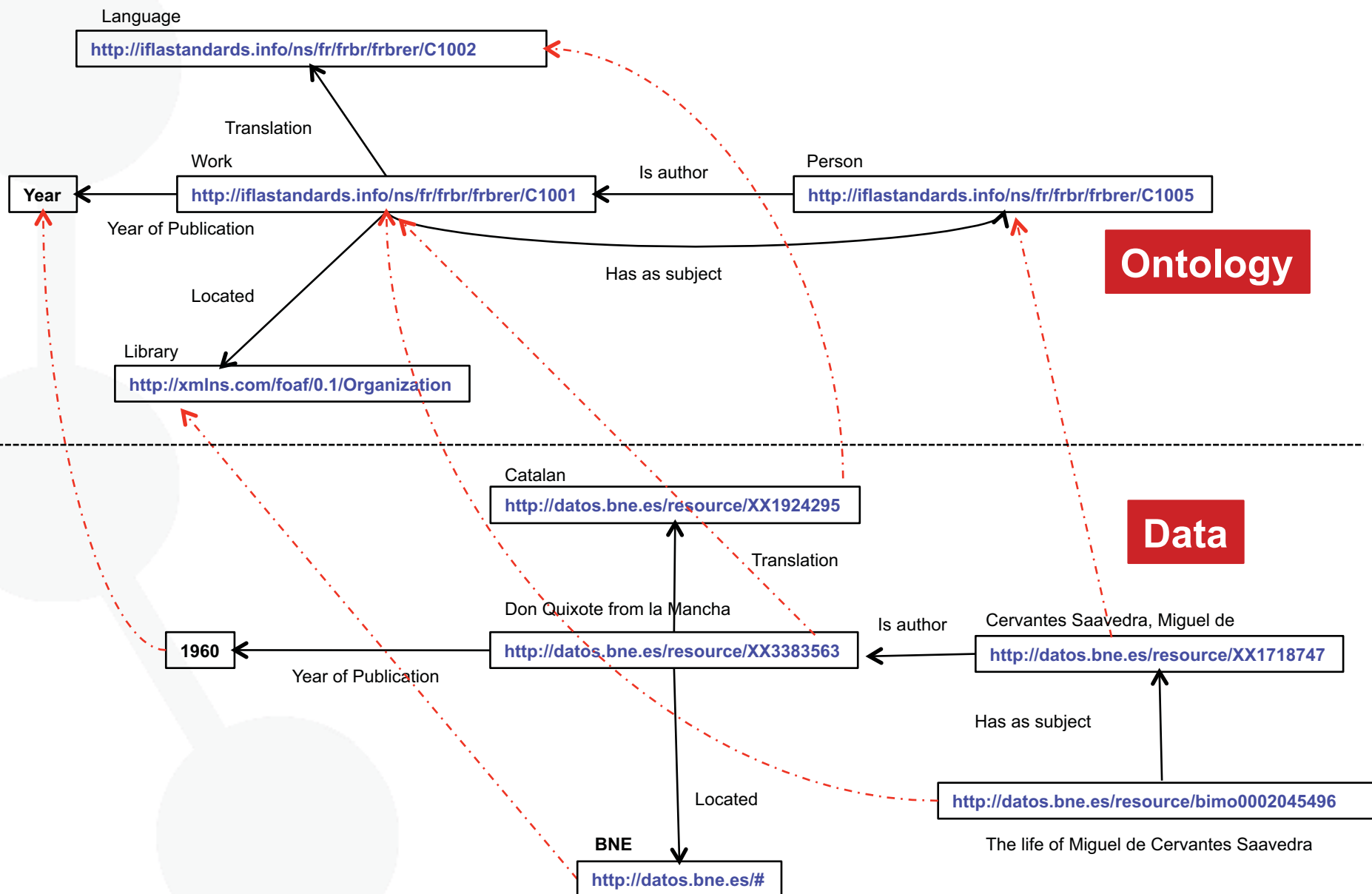
Browsing through the data



The model (Ontology) and the data



The model (Ontology) and the data



- During the successive iterations to generate RDF, **improvements in the origin records** have been produced. Some of the examples are :
 - NON - valid combinations of subfields have been identified, according to the standard MARC 21:
 - Example: 100 \$a \$d **\$1**
 - Errors in the encoding of certain character strings have been identified :
 - Example: **BiografÃas.**
 - Errors in some of the control fields have been identified :
 - Example: A flag has been found in the field **001**, which when does not correspond to the standard does not present a flag.

Marimba: Discovery of links to other datasets

- Marimba uses VIAF as a source for generating equivalence links (owl:sameAs) to other bibliographical datasets.
- For that, using a file which contains the correspondence between VIAF and the libraries participating in VIAF:
 - 1) Locates the IDs of the BNE and stores its corresponding VIAF.
 - 2) From the corresponding VIAF IDs, it generates links to other libraries that also have some correspondence with these IDs.

- **Modelling:**

- Open Metadata Registry
- Neon Toolkit



- **Mapping and generation**

- **MARiMbA:** Library-oriented, supports and facilitates the entire process of transformation from MARC21 to RDF



- **Publication:**

- Virtuoso Universal Server
- Pubby
- CKAN registry
- Sitemap4rdf

[illegible]

- **Exploitation:**

- Web Applications that visualize data using SPARQL

Other data initiatives linked from libraries

- French National Library
- EU Congress Library
- German National Library
- British Library
- Spain:
 - Subject headings list for public libraries of the Ministry of Culture
 - In SKOS
 - Linked with RAMEAU and LOC subjects
 - Virtual Library of the School of Salamanca
 - W3C Use Cases:
 - Polygraph Virtual Library
 - Ontology of Cantabria's Cultural Heritage